EMBEDDED UNIVERSAL INTEGRATED CIRCUIT CARD (EUICC) FILE SYSTEM MANAGEMENT WITH PROFILE SWITCHING

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of U.S. patent application Ser. No. 15/366,737, entitled "EMBEDDED UNIVERSAL INTEGRATED CIRCUIT CARD (eUICC) FILE SYSTEM MANAGEMENT WITH PROFILE SWITCHING," filed Dec. 1, 2016, which claims the benefit of U.S. Provisional Patent Application No. 62/266,464, entitled "EMBEDDED UNIVERSAL INTEGRATED CIRCUIT CARD (eUICC) FILE SYSTEM MANAGEMENT WITH PROFILE SWITCHING" filed Dec. 11, 2015, the contents of which are incorporated herein by reference in their entirety for all purposes.

FIELD

[0002] The described embodiments set forth various techniques for embedded Universal Integrated Circuit Card (eUICC) file system management with electronic Subscriber Identity Module (eSIM) profile switching.

BACKGROUND

[0003] Most mobile devices are configured to receive and operate removable Universal Integrated Circuit Cards (UICCs) that enable the mobile devices to access services provided by wireless service providers, which can include mobile network operators (MNOs) and virtual MNOs (VMNOs). In particular, each UICC includes at least a microprocessor and a read-only memory (ROM), where the ROM is configured to store different applets and authentication data that the mobile device can use to register and access services of the wireless service providers. Typically, a UICC takes the form of a small removable card (e.g., a SIM card) that is configured to store a single MNO profile and to be inserted into a UICC-receiving bay included in the mobile device. In more recent implementations, however, UICCs are being embedded directly into system boards of mobile devices and are configured to store one or more MNO profiles (e.g., electronic SIMs (eSIMs))—e.g., one eSIM (profile) for a local MNO, and another eSIM (profile) for an international MNO. Notably, these embedded UICCs (eUICCs) provide several advantages over traditional, removable UICCs. For example, some eUICCs include a rewritable memory that can facilitate eSIM addition, deletion, and updating for accessing new and/or different services provided by MNOs. EUICCs can also eliminate the necessity of including UICC-receiving bays within mobile devices. The implementation of eUICCs therefore not only increases the flexibility of mobile devices, but also simplifies their design and frees up space for other components.

[0004] Despite the foregoing advantages provided by eUICCs, new challenges arise with respect to maintaining backward compatibility with external processing modules designed to work with file systems as installed on and structured for UICCs, while also providing the increased flexibility offered by eUICCs, particularly with eSIM (profile) switching that impacts the file systems installed on eUICCs. Legacy file systems for legacy UICCs can mix MNO specific information with hardware specific (e.g., UICC based) information. File system management for eUICCs, on which eSIM profiles can be added, deleted, and/or modified, can be improved to allow for flexible eSIM profile management as well as retain backward compatibility with external processing modules, e.g., a terminal interface, that are also designed to work with legacy UICCs.

SUMMARY

[0005] Representative embodiments set forth herein disclose various techniques for dynamically organizing and managing file systems on an embedded Universal Integrated Circuit Card (eUICC) in response to electronic Subscriber Identity Module (eSIM) changes on the eUICC. Hardware specific file information, e.g., hardware-based eUICC parameters, which may apply to multiple eSIMs and/or to multiple MNOs, is included in a default eUICC file system. Mobile Network Operator (MNO) specific information, e.g., MNO-specified parameters, is included in individual eSIMs associated with corresponding MNOs. Customized eUICC level files are created, stored, modified, and/or replaced on the eUICC based at least in part on combining information from one or more default eUICC files and MNO specific information extracted from one or more eSIMs at installation and/or in response to a change of state of the one or more eSIMs, such as when enabling, disabling, or updating the one or more eSIMs on the eUICC.

[0006] A representative embodiment sets forth a method for file system management of an eUICC for an eSIM associated with an MNO. Specifically, the method is implemented at the eUICC that stores the eSIM, and includes: receiving an eSIM to be stored within the eUICC; storing the eSIM within the eUICC; parsing a file system of the eSIM to identify MNO specific information applicable to an eUICC level file; and updating the eUICC level file based at least in part on the MNO specific information.

[0007] Another representative embodiment sets forth a method for file system management of an eUICC for an eSIM associated with an MNO. Specifically, the method is implemented at the eUICC that stores the eSIM, and includes: obtaining an eSIM to be enabled within the eUICC; identifying MNO specific information in the eSIM; constructing at least one customized eUICC level file based on the MNO specific information; storing the at least one customized eUICC level file in the eUICC for future use; and updating corresponding eUICC level files based on the at least one customized eUICC level file, in response to receipt of an indication to enable the eSIM on the eUICC.

[0008] This Summary is provided merely for purposes of summarizing some example embodiments so as to provide a basic understanding of some aspects of the subject matter described herein. Accordingly, it will be appreciated that the above-described features are merely examples and should not be construed to narrow the scope or spirit of the subject matter described herein in any way. Other features, aspects, and advantages of the subject matter described herein will become apparent from the following Detailed Description, Figures, and Claims.

[0009] Other aspects and advantages of the embodiments described herein will become apparent from the following detailed description taken in conjunction with the accompanying drawings which illustrate, by way of example, the principles of the described embodiments.